I will add one unpublished observation to the well-known facts here brought together. Two sporanges of *Saprolegnia* opened at an early stage of the partial segregation of the protoplasm into masses. Part of the protoplasm in each slowly escaped and aggregated into rounded masses. The first discharged masses underwent the usual pathological changes and diffluence ; the later masses (from both sporangia) had already acquired the power of forming contractile vacuoles possessed by the zoospores ; the numerous small vacuoles appeared and contracted regularly, lines of separation formed and deepened, and the masses divided into zoospores, which separated and swarmed, just like the protoplasm which remained in the sporange, though more slowly. This observation seems to afford a crucial test of the truth of the thesis that the contractile vacuole has the function of preventing excessive vacuolation and diffluence of naked cells in water.

The following is a brief summary of the points on which the above thesis rests :—

1. All naked protoplasmic bodies living in fresh water have at least one contractile vacuole.
2. The possession of this is quite independent of the systematic position of the organism and of the presence of chlorophyll *.
3. The vacuole loses its contractility on the formation of a strong cell-wall or cyst, and may even disappear.
4. It is absent from Gregarinida and Opalina and the Radiolaria which inhabit saline liquids.
5. When, owing to morbid conditions, the efficiency of the contractile vacuole is impaired, excessive vacuolation and diffluence ensue.
6. Conversely, as soon as contractile vacuoles appear, the tendency to excessive vacuolation and diffluence is arrested.

It may be suggested that the perforations of the nephridial cells in Vermes and embryonic mollusks and of the epiblastic gland-cells of Vermes and Arthropods are due to the persistence of the contractile vacuole, the opening of which has become permanent, while its contractility has been superseded in the kidneys at least by other arrangements. Even the goblet-cells of mucous epithelia may possibly be traced to this origin.

On Adelphotaxy, *an undescribed Form of Irritability.*

By Professor Marcus M. Hartog, D.Sc., M.A.†

In *Achlya*, a genus of Saprolegnieæ, the zoospores lie in the sporange before liberation closely appressed together, with their long axes parallel, instead of showing the rotatory hustling movements of other species. On liberation, instead of separating and swimming

* Hence the function cannot be exclusively respiratory, though it may aid respiration.

† Read at the British Association (Bath), 1888.

off, each on its own account, they remain near the mouth of the sporange, each in turn edging its way in between those that have already escaped, with its narrower flagellate (anterior) end inwards. They thus form a hollow sphere, each zoospore rotating round its long axis (radial to the sphere) before encysting in its place. The only explanation that will fit these phenomena is that these zoospores are endowed with a peculiar irritability, in virtue of which they tend to place themselves close together side by side, with their long axes parallel. This irritability is only exerted at a short distance; for if a zoospore be pushed as little as its long diameter away, whether by accident or design, it fails to find its place, but swims off to and fro, instead of rotating *in situ*, before encysting.

In a critical review of a paper by Rothert, I have given the name "*adelphotaxy*" to this form of irritability, *consisting in the tendency of spontaneously motile cells to assume definite positions with regard to their fellows.*

Leaving aside the kindred question of tissue-formation and the processes in the embryo-sac of Phanerogams, adelphotaxy is of rare occurrence in the Vegetable Kingdom. Two good instances occur in the Chlorophytes. In *Pediastrum* the contents of each cell of the flat disk break up into sixteen (or thirty-two) zoospores, which swarm in the cell and then unite edge to edge to form a new disk. So in each cell of a *Hydrodictyon* the many thousand zoospores unite end to end to form a new network with hexagonal meshes.

In many of the Myxomycetes the plasmodia aggregate together before fructification to form the compound masses termed æthalia; possibly even the very formation of plasmodia may be regarded as a mode of adelphotaxy.

We may perhaps go a step further and describe the parallel or converging courses of *Fungus hyphæ* to form mycelium-strings, fruit-bodies, and pseudo-parenchyma as extreme cases of adelphotaxy.

I think this principle affords a ready explanation of many cases of cellular aggregations in the animal embryo and the formation of the spermatophores of many animals, notably Limicolous worms.

The relations of sexual and isogamous union of gametes to adelphotaxy are obvious; for, though in some cases of sexual union chemotaxy has been shown by Pfeffer to be involved in bringing the active gamete from a distance, that will not cover the actual fusion of the two cells.

What may be the mechanism of adelphotaxy it is impossible to see at present; but its existence as a distinct mode of irritability must now be recognized.

On the Hersiliidæ, *a new Family of Commensal Copepoda.* By M. Eugène Canu.

The author has discovered at Wimereux two new genera, very nearly allied to *Hersilia* and commensals of various Invertebrates,